A 'smarter' way of diagnosing the at risk foot: Development of a novel tool based on vibratory measurements in subjects with diabetes.

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Aim: To identify optimal vibration perception thresholds (VPT) to help design a 'smart' risk assessment tool in subjects with diabetes.

Methods: We used our clinical database (Diabeta3) to identify baseline VPT in subjects in whom there is at least a 10 Volt (V) rise in VPT (hallux pulp) using a Neurothesiometer over time. The gradient chosen is based on previous work. The data helped us model the vibratory frequencies of a plate device (Vibrascan), which produces a more objective risk assessment than VPT. We used a longitudinal multilevel model to analyse the data.

Results: In 929 subjects with diabetes showing a 10 V deterioration and who had a total of 8874 measurements, VPT increased from 13.8±8.4 V at first visit to 22.8±13.2 V ($p<0.001$) at final visit. In subjects (N=3920, 29995 measurements) who showed a smaller deterioration (<10 V), VPT increased from 13.7±10.7V to 14.6±11.3 V ($p<0.01$). Duration of diabetes, microalbuminuria and LDL cholesterol are positive significant correlates with increasing VPT.

Conclusion: Based on these data we used the Neurothesiometer equivalent of 10V increments to help us develop Vibrascan as a modern and easy to use foot screening tool. The positive cardiovascular correlates strengthen the role of developing a vibratory screening tool utilising these data. The details of the device itself and its novelty in screening of subjects will be discussed in detail.